Kramer Electronics, Ltd.

USER MANUAL

Models:

VS-606xl, *6x6 Video/Audio Matrix Switcher*

VS-808xl, *8x8 Video/Audio Matrix Switcher*

VS-804xl, *8x4 Video/Audio Matrix Switcher*

VS-646, *6x6 Video/Balanced Audio Matrix Switcher*

VS-848, *8x8 Video/Balanced Audio Matrix Switcher*

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1 Introduction

Welcome to Kramer Electronics! Since 1981, Kramer Electronics has been providing a world of unique, creative, and affordable solutions to the vast range of problems that confront the video, audio, presentation, and broadcasting professional on a daily basis. In recent years, we have redesigned and upgraded most of our line, making the best even better! Our 1,000-plus different models now appear in 11 groups[1] that are clearly defined by function.

Thank you for purchasing your **VS-606xl** *6x6 Video/Audio Matrix Switcher* and/or **VS-808xl** *8x8 Video/Audio Matrix Switcher* and/or **VS-804xl** *8x4 Video/Audio Matrix Switcher* and/or **VS-646** *6x6 Video/Balanced Audio Matrix Switcher* and/or **VS-848** *8x8 Video/Balanced Audio Matrix Switcher* which are ideal for the following typical applications:

- Any professional system requiring outstanding value in a matrix
- Production and duplications facilities, rental and staging
- Security, CCTV, and home theater systems
- Production studios
- Audio/video duplication facilities
- Professional presentation systems
- Production studio vertical interval routing between Genlocked sources

The package includes the following items:

- **VS-606**xl 6x6 Video/Audio Matrix Switcher and/or
  VS-808xl 8x8 Video/Audio Matrix Switcher and/or
  VS-804xl 8x4 Video/Audio Matrix Switcher and/or
  VS-646xl 6x6 Video/Balanced Audio Matrix Switcher and/or
  VS-848xl 8x8 Video/Balanced Audio Matrix Switcher
- Windows®-based Kramer control software
- Power cord, null-modem adapter and a Kramer IR remote control transmitter
- This user manual[2]

1 GROUP 1: Distribution Amplifiers; GROUP 2: Switchers and Matrix Switchers; GROUP 3: Control Systems; GROUP 4: Format/Standards Converters; GROUP 5: Range Extenders and Repeaters; GROUP 6: Specialty AV Products; GROUP 7: Scan Converters and Scalers; GROUP 8: Cables and Connectors; GROUP 9: Room Connectivity; GROUP 10: Accessories and Rack Adapters; GROUP 11: Sierra Products

2 Download up-to-date Kramer user manuals from our Web site: http://www.kramerelectronics.com

2 Getting Started

We recommend that you:

- Unpack the equipment carefully and save the original box and packaging materials for possible future shipment
- Review the contents of this user manual
- Use Kramer high-performance high-resolution cables[1]

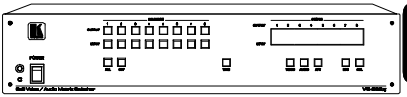
2.1 Quick Start

This quick start chart summarizes the basic setup and operation:

1 The complete list of Kramer cables is on our Web site at http://www.kramerelectronics.com

Step 1: Mount the machine - see section 5

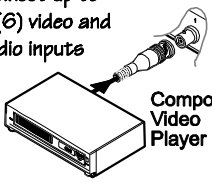
Mount the machine in a rack or stick the 4 rubber feet to the underside



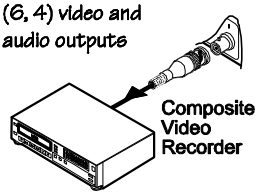
Applies to: VS-606xl, VS-808xl, VS-804xl VS-848 and VS-646)

Step 2: Connect the inputs and outputs - see section 6

Connect up to 8 (6) video and audio inputs



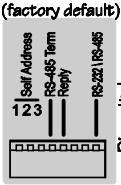
Connect up to 8 (6, 4) video and audio outputs



Configure the SYNC input

Audio connections are not shown

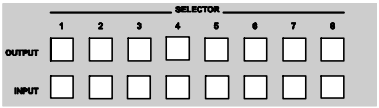
DIPs are set to OFF (factory default)



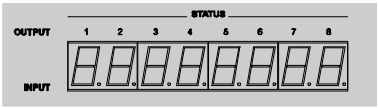
If required, connect an RS-232 Control Port, and/or an RS-485 port

Step 3: Turn the power ON

Step 4: Set the machine - see section 7



Use the SELECTOR buttons to switch the inputs to the outputs



Read the STATUS on the 7-segment display

Connect a selected input to ALL the outputs

Disconnect an output

VIDEO - Switching relates to the video signal
AUDIO - Switching relates to the audio signal
AFV - Audio follows video when switching

Store (STO) and recall (RCL) actions

Step 5: Operate the machine

Operate via the front panel buttons, IR remote control, RS-232 and RS-485

3 Overview

The Kramer **VS-606xl**, **VS-804xl** and **VS-808xl** are high performance matrix switchers for composite video and unbalanced stereo audio signals (via RCA connectors). The Kramer **VS-646** and **VS-848** are high performance matrix switchers for composite video and balanced stereo audio signals (via terminal block connectors). Switching during the vertical interval ensures glitch-free switching with genlocked sources.

The matrix switchers feature:

- A bandwidth of 200MHz that ensures transparency even in the most critical applications
- A TAKE button, which allows you to place multiple switches in a queue and then activate them simultaneously with one touch of this button
- Memory locations, letting you store multiple switches as presets (salvos) to be recalled and executed when needed
- Audio-follow-video or audio breakaway option (to switch audio independently from video)
- Vertical interval switching
- An external Sync/Genlock input that may be programmed to switch according to the timing of either this input or of source number 1
- Selectable sync signal termination

The matrix switcher is dependable, rugged and fits into two vertical spaces (2U) of a standard 19" rack. To achieve the best performance:

- Connect only good quality connection cables, thus avoiding interference, deterioration in signal quality due to poor matching, and elevated noise levels (often associated with low quality cables)
- Avoid interference from neighboring electrical appliances and position your Kramer matrix switcher away from moisture, excessive sunlight and dust

4 Your Matrix Switchers

The **VS-606xl**, **VS-808xl** and **VS-804xl** are video/unbalanced audio matrix switchers that differ only in the number of their input and output channels:

- **VS-606xl**, illustrated in *Figure 1*, has 6 inputs and 6 outputs
- **VS-808xl**, illustrated in *Figure 2*, has 8 inputs and 8 outputs
- **VS-804xl**, illustrated in *Figure 3*, has 8 inputs and 4 outputs

Table 1 and *Table 2* define their front and rear panel features[1] respectively.

The **VS-646** and the **VS-848** are video/balanced audio matrix switchers that differ in the number of their input and output channels:

- **VS-646**, illustrated in *Figure 4*, has 6 inputs and 6 outputs
- **VS-848**, illustrated in *Figure 5*, has 8 inputs and 8 outputs

Table 3 and *Table 4* define their front and rear panel features[1] respectively.

1 Which are the same, except for the number of inputs and outputs

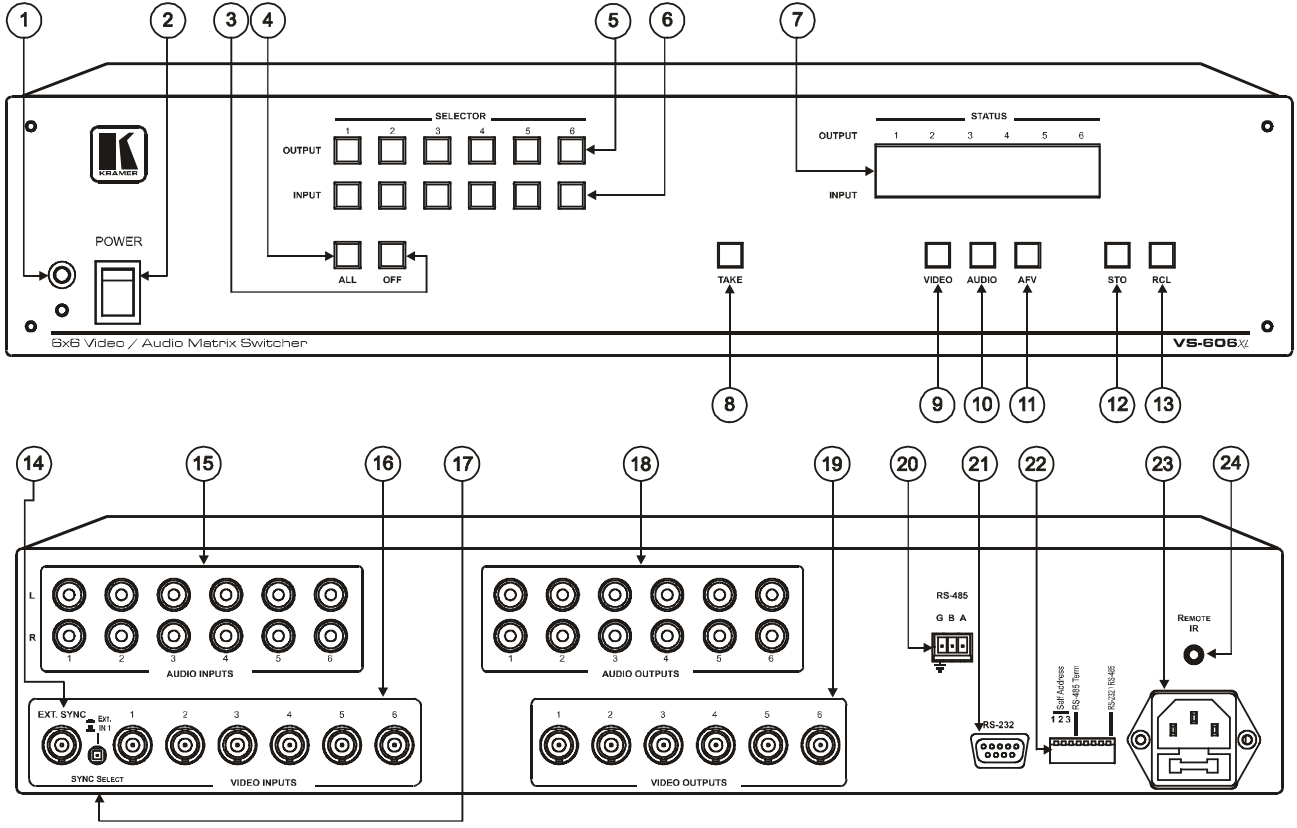


Figure 1: VS-606xl 6x6 Video/Audio Matrix Switcher

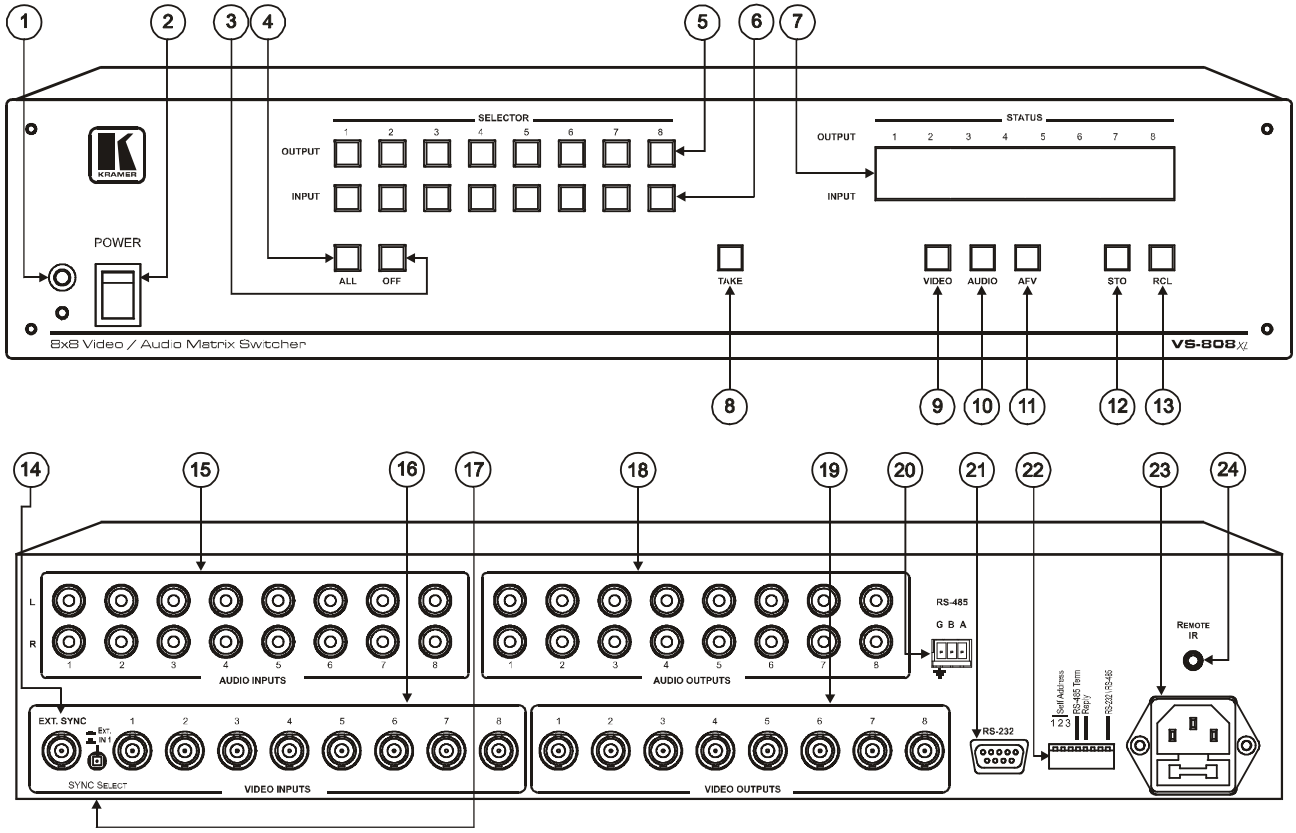


Figure 2: VS-808xl 8x8 Video/Audio Matrix Switcher

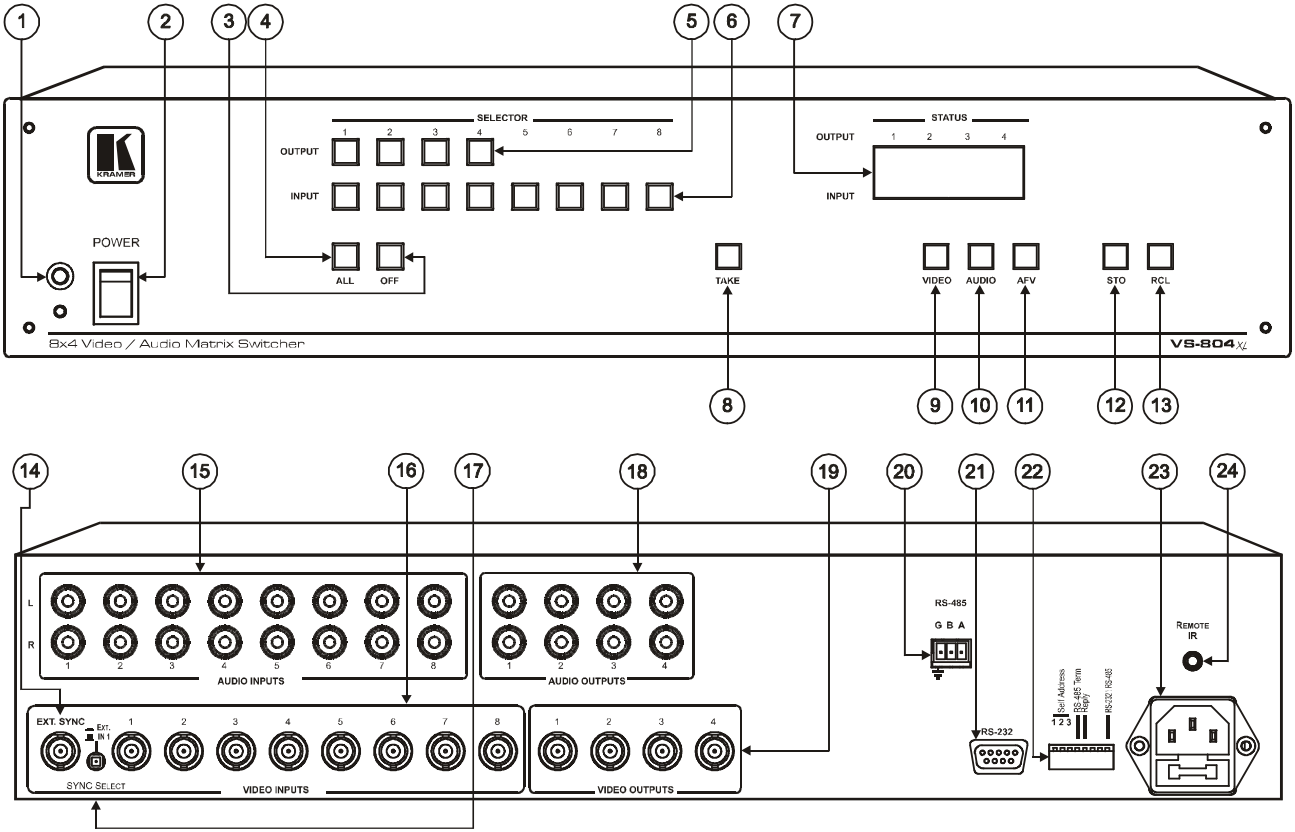


Figure 3: VS-804xl 8x4 Video/Audio Matrix Switcher

Table 1: Front Panel Video/Audio Matrix Switcher Features

#	Feature	Function
1	IR Receiver	The red LED is illuminated when receiving signals from the infrared remote control transmitter
2	*POWER* Switch	Illuminated switch for turning the unit ON or OFF
3	*OFF* Button	An OFF-OUT combination disconnects that output from the inputs; an OFF-ALL combination disconnects all the outputs
4	*ALL* Button	Pressing ALL followed by an INPUT button, connects that input to all outputs[1]
5	*OUTPUT* Buttons	Select the output to which the input is switched[2]
6	*INPUT* Buttons	Select the input to switch to the output[2]
7	*STATUS* 7-segment Display	Displays the selected audio[3] or video[4] input switched to the output (marked above each input[2])
8	*TAKE* Button	Pressing *TAKE* toggles the mode between the CONFIRM mode[5] and the AT ONCE mode (user confirmation per action is unnecessary)
9	*VIDEO* Button	When pressed, this button is illuminated and all actions relate to video
10	*AUDIO* Button	When pressed, this button is illuminated and all actions relate to audio
11	*AFV* Button	When pressed, this button is illuminated and all actions relate to video and audio channels. Audio channels follow the video channels
12	*STO* (STORE) Button	Pressing STO followed by an output button stores the current setting[6]
13	*RCL* (RECALL) Button	Pressing the RCL button and the corresponding OUTPUT key recalls a setup from the non-volatile memory. The stored status blinks. Pressing a different OUTPUT button lets you view[7] another setup. After making your choice, pressing the RCL button again implements the new status

1 For example, press ALL and then Input button # 2 to connect input # 2 to all the outputs

2 For the VS-606xl, 6 inputs and 6 outputs; for the VS-808xl, 8 inputs and 8 outputs; for the VS-804xl, 8 inputs and 4 outputs

3 When the Audio button illuminates, that is, when the audio breakaway mode is selected

4 When the Video button illuminates, that is, when the video breakaway mode is selected

5 When in Confirm mode, the TAKE button illuminates

6 For example, press STO and then the Output button # 3 to store in Setup # 3

7 Only view, nothing is implemented at this stage

Table 2: Rear Panel Video/Audio Matrix Switcher Features

#	Feature	Function
14	*EXT. SYNC* BNC Connector	Connects to the external SYNC source
15	*AUDIO INPUT* RCA Connectors	Connect to the audio sources[1]
16	*VIDEO INPUT* BNC Connectors	Connect to the video sources[1]
17	*SYNC SELECT* Source Selector Button	Pushing in selects the (EXT.) external sync source on the SYNC connector; releasing selects the (IN 1) internal sync on the VIDEO IN 1 connector
18	*AUDIO OUTPUT* RCA Connectors	Connect to the audio acceptors[1]
19	*VIDEO OUTPUT* BNC Connectors[2]	Connect to the video acceptors[1]
20	*RS-485* Connector	RS-485 port on detachable terminal block
21	*RS-232* 9-pin D-sub Connector	Connects to the PC or other serial controller
22	Setup DIP-switches	DIP 1, 2, and 3 for machine SELF ADDRESS #; DIP 4 for RS-485 termination, DIP 5 for reply from switcher to PC, DIP 8 for RS-232/RS-485 communication
23	Power Connector with *Fuse*	AC connector enabling power supply to the unit
24	*REMOTE IR* 3.5mm Mini Jack	Connect to an external IR receiver unit for controlling the machine via an IR remote controller (instead of using the front panel IR receiver)[3]

1 For the VS-606xl, 6 inputs and 6 outputs; for the VS-808xl, 8 inputs and 8 outputs; for the VS-804xl, 8 inputs and 4 outputs

2 For RGBS applications, one of the sync channels (H or V) may be used for the S channel

3 Optional. Can be used instead of the front panel (built-in) IR receiver to remotely control the machine (only if the internal IR connection cable has been installed)

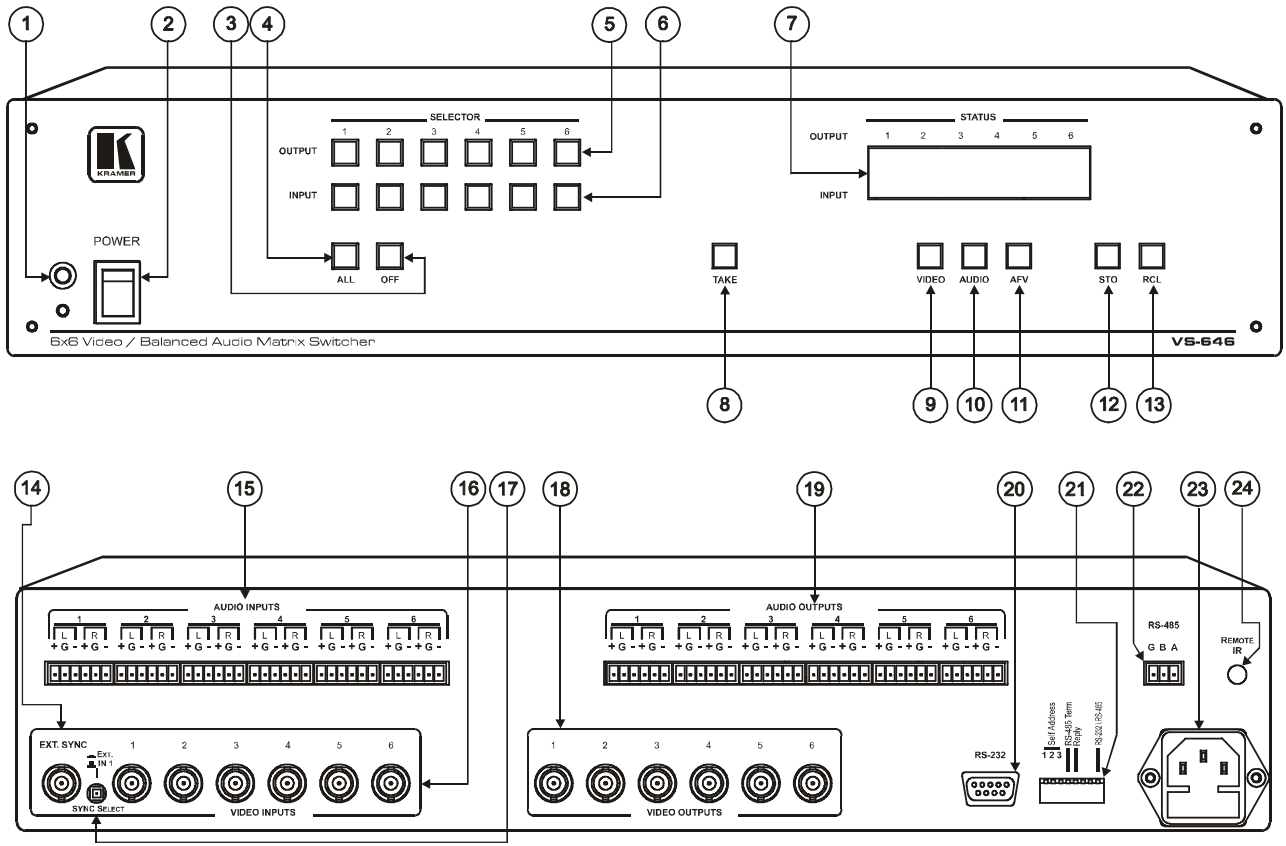


Figure 4: VS-646 6x6 Video/Balanced Audio Matrix Switcher

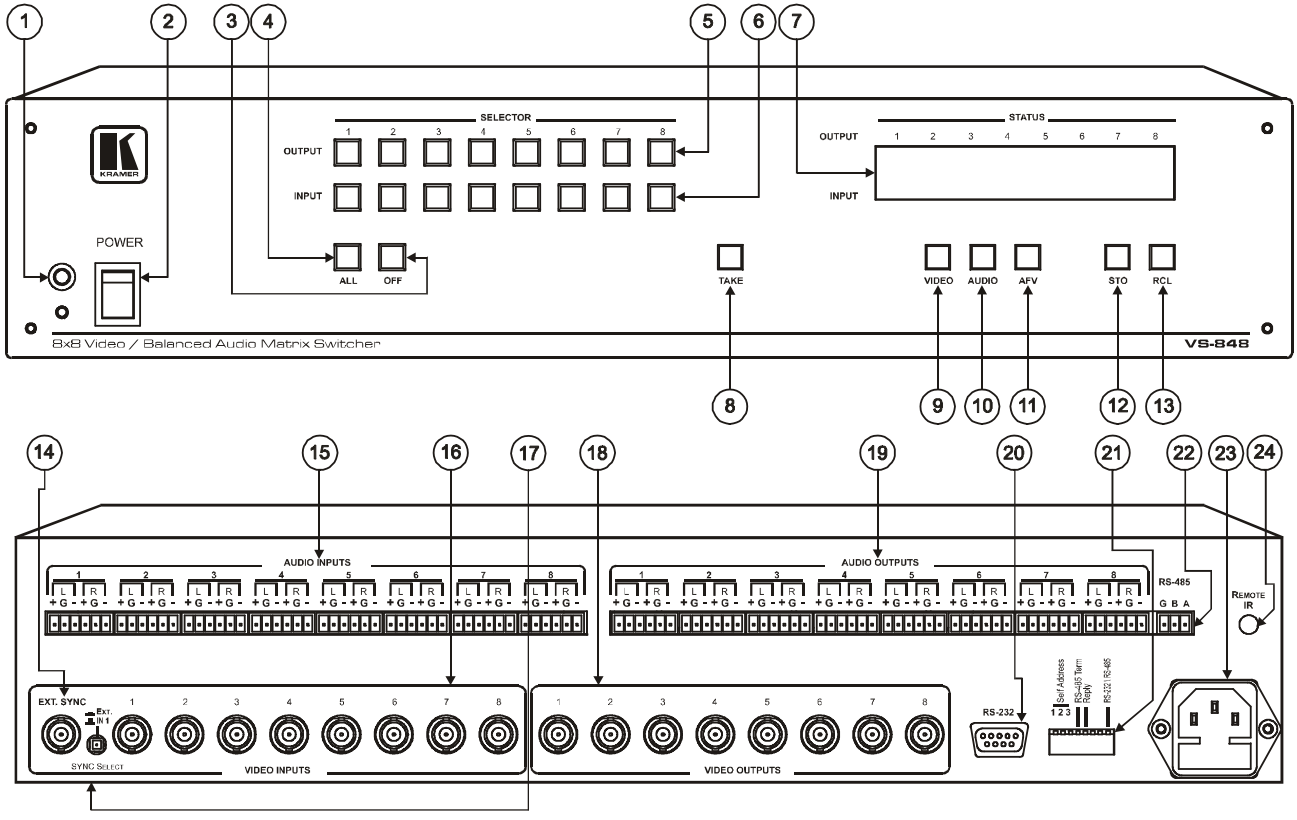


Figure 5: VS-848 8x8 Video/Balanced Audio Matrix Switcher

Table 3: Front Panel VS-646 6x6 (VS-848 8x8) Features

#	Feature	Function
1	IR Receiver	The LED illuminates when receiving signals from the infrared remote control transmitter
2	*POWER* Switch	Illuminated switch for turning the unit ON or OFF
3	*OFF* Button	An OFF-OUT combination disconnects that output from the inputs; an OFF-ALL combination disconnects all the outputs
4	*ALL* Button	Pressing ALL followed by an INPUT button, connects that input to all outputs[1]
5	*OUTPUT* Buttons	Select the output to which the input is switched[2]
6	*INPUT* Buttons	Select the input to switch to the output[2]
7	*STATUS* 7-segment Display	Displays the selected audio[3] or video[4] input switched to the output (marked above each input[2])
8	*TAKE* Button	Pressing *TAKE* toggles the mode between the CONFIRM mode[5] and the AT ONCE mode (user confirmation per action is unnecessary)
9	*VIDEO* Button	When pressed, this button is illuminated and all actions relate to video
10	*AUDIO* Button	When pressed, this button is illuminated and all actions relate to audio
11	*AFV* Button	When pressed, this button is illuminated and all actions relate to video and audio channels. Audio channels follow the video channels
12	*STO* (STORE) Button	Pressing STO followed by an output button stores the current setting[6]
13	*RCL* (RECALL) Button	Pressing the RCL button and the corresponding OUTPUT key recalls a setup from the non-volatile memory. The stored status blinks. Pressing a different OUTPUT button lets you view[7] another setup. After making your choice, pressing the RCL button again implements the new status

1 For example, press ALL and then Input button # 2 to connect input # 2 to all the outputs

2 For the VS-646, 6 inputs and 6 outputs; for the VS-848, 8 inputs and 8 outputs

3 When the Audio button illuminates, that is, when the audio breakaway mode is selected

4 When the Video button illuminates, that is, when the video breakaway mode is selected

5 When in Confirm mode, the TAKE button illuminates

6 For example, press STO and then the Output button # 3 to store in Setup # 3

7 Only view, nothing is implemented at this stage

Table 4: Rear Panel VS-646 6x6 (VS-848 8x8) Features

#	Feature	Function
14	*EXT. SYNC* BNC Connector	Connects to the external SYNC source
15	*AUDIO INPUT* Terminal Block Connectors	Connect to the audio sources[1]
16	*VIDEO INPUT* BNC Connectors	Connect to the video sources[1]
17	*SYNC SELECT* Source Selector Button	Pushing in selects the (EXT) external sync source on the SYNC connector; releasing selects the (IN 1) internal sync on the VIDEO IN 1 connector
18	*VIDEO OUTPUT* BNC Connectors[2]	Connect to the video acceptors[1]
19	*AUDIO OUTPUT* RCA Connectors	Connect to the audio acceptors[1]
20	*RS-232* 9-pin D-sub Connector	Connects to the PC or other Serial Controller
21	Setup DIP-switches	DIP 1, 2, and 3 for machine SELF ADDRESS #; DIP 4 for RS-485 termination, DIP 5 for reply from switcher to PC, DIP 8 for RS-232/RS-485 communication
22	*RS-485* Connector	RS-485 port on detachable terminal block
23	Power Connector with *Fuse*	AC connector enabling power supply to the unit
24	*REMOTE IR* 3.5mm Mini Jack	Connect to an external IR receiver unit for controlling the machine via an IR remote controller (instead of using the front panel IR receiver)[3]

4.1 Using the IR Transmitter

You can use the **RC-IR2** IR transmitter to control the machine via the built-in IR receiver on the front panel or, instead, via an optional external IR receiver[4]. The external IR receiver can be located 15 meters away from the machine. This distance can be extended to up to 60 meters when used with three extension cables[5].

Before using the external IR receiver, be sure to arrange for your Kramer dealer to insert an internal IR connection cable[6], which is required so that the REMOTE IR 3.5mm connector can be used. Connect the external IR receiver to the REMOTE IR 3.5mm connector.

Control the matrix switcher using the front panel buttons, or remotely via the Kramer Infrared Remote Control Transmitter, via an external remote IR receiver (optional), or via RS-485 or RS-232 serial commands transmitted by a touch screen system, PC, or other serial controller.

1 For the VS-646, 6 inputs and 6 outputs; for the VS-848, 8 inputs and 8 outputs

2 For RGBS applications, one of the sync channels (H or V) may be used for the S channel

3 Optional. Can be used instead of the front panel (built-in) IR receiver to remotely control the machine (only if the internal IR connection cable has been installed)

4 P/N: 95-0104050

5 P/N: 95-0103050

6 P/N: 505-70434010-S

5 Installing on a Rack

This section describes how to install your product in a rack.

Before Installing in a rack

Before installing in a rack, be sure that the environment is within the recommended range:	
Operating temperature range	+5° to +45° C (41° to 113° F)
Operating humidity range	10 to 90% RHL, non-condensing
Storage temperature range	-20° to +70° C (-4° to 158° F)
Storage humidity range	5 to 95% RHL, non-condensing

CAUTION!!

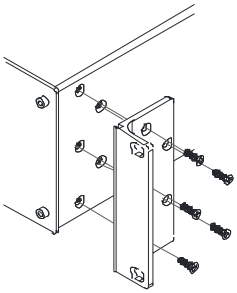
When installing on a 19" rack, avoid hazards by taking care that:

1. It is located within the recommended environmental conditions, as the operating ambient temperature of a closed or multi unit rack assembly may exceed the room ambient temperature.
2. Once rack mounted, enough air will still flow around the machine.
3. The machine is placed straight in the correct horizontal position.
4. You do not overload the circuit(s). When connecting the machine to the supply circuit, overloading the circuits might have a detrimental effect on overcurrent protection and supply wiring. Refer to the appropriate nameplate ratings for information. For example, for fuse replacement, see the value printed on the product label.
5. The machine is earthed (grounded) in a reliable way and is connected only to an electricity socket with grounding. Pay particular attention to situations where electricity is supplied indirectly (when the power cord is not plugged directly into the socket in the wall), for example, when using an extension cable or a power strip, and that you use only the power cord that is supplied with the machine.

How to Rack Mount

To rack-mount a machine:

1. Attach both ear brackets to the machine. To do so, remove the screws from each side of the machine (3 on each side), and replace those screws through the ear brackets.



2. Place the ears of the machine against the rack rails, and insert the proper screws (not provided) through each of the four holes in the rack ears.

Note that:

- **In some models, the front panel may feature built-in rack ears**
- Detachable rack ears can be removed for desktop use
- Always mount the machine in the rack before you attach any cables or connect the machine to the power
- If you are using a Kramer rack adapter kit (for a machine that is not 19"), see the Rack Adapters user manual for installation instructions (you can download it at: http://www.kramerelectronics.com)

6 Connecting[1] the VS-808xl Video/Audio Matrix Switcher

To connect a single[2] **VS-808xl** switcher, as illustrated in the example in *Figure 6*, do the following[3]:

1. Connect up to eight[1] composite video sources (for example, composite video players) to the VIDEO INPUT BNC connectors and the AUDIO INPUT R and L RCA[4] connectors.
2. Connect the eight[1] VIDEO OUTPUT BNC connectors and the AUDIO OUTPUT R and L RCA[4] connectors to up to eight[1] composite video acceptors (for example, composite video recorders).
3. If required, connect to a PC or other controller via RS-232 (see section 6.2) or RS-232 and RS-485 (see section 6.3).
4. Connect the power cord to the mains electricity[5].
5. Set the DIP-switches (see section 6.1).

1 From this section on, all the information is relevant also to the VS-606xl (with 6 inputs and 6 outputs), VS-804xl (with 8 inputs and 4 outputs), VS-646 (with 6 inputs and 6 outputs) and VS-848 (with 8 inputs and 8 outputs), unless noted otherwise

2 Note that you can connect up to 8 units to a PC or other RS-232 or RS-485 controller

3 Switch OFF the power on each device before connecting it to your VS-808xl. After connecting your VS-808xl, switch on its power and then switch on the power on each device

4 The VS-606xl and 804xl also have audio RCA connectors, and the VS-646 and VS-848 have audio terminal block connectors

5 Not illustrated in *Figure 6*

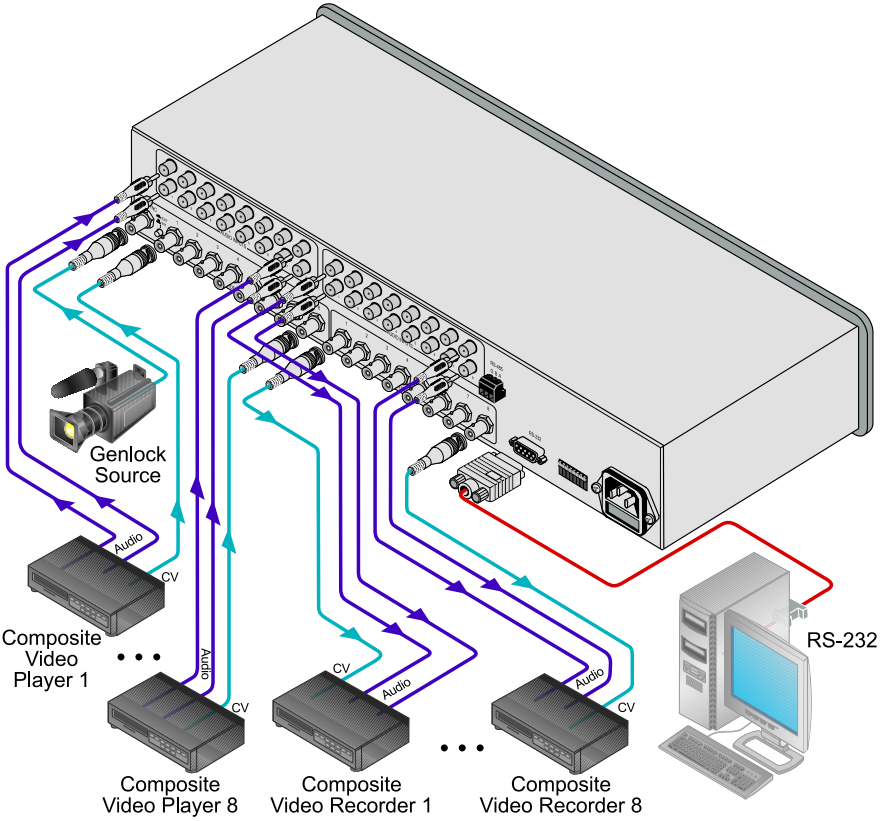


Figure 6: Connecting the Video Sources and Acceptors to the Rear Panel

6.1 Setting the DIP-Switches

This section describes the machine setup and DIP-switch selection. *Figure 7* and *Table 5* describe the **VS-808xl** DIP-switches.

Table 5: DIP-switch Settings

DIPS	Function	Description
1, 2, 3	Self Address	Determines the machine number
4	RS-485 Term[1]	ON for RS-485 Line Termination OFF for no RS-485 Line Termination
5	Reply	ON enables reply from the switcher to PC OFF disables reply from the switcher to PC
6, 7	Reserved	OFF
8	RS-232\RS-485	ON enables RS-232 communication between the switcher and PC OFF enables RS-485 communication between the switcher and PC

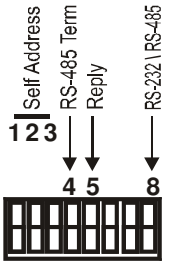


Figure 7: DIP-switch Configuration

To set the DIP-switches, use a small flathead screwdriver to move the DIP-switches to the ON or OFF position as described in the following sections.

6.1.1 Self Address DIP-Switches

The Self Address DIP-switch determines the position of a **VS-808xl** unit in the sequence, specifying which **VS-808xl** unit is being controlled, when several **VS-808xl** units are controlled by a PC or serial controller. Set the Self Address on a **VS-808xl** unit via DIP-switches 1, 2, and 3, according to *Table 6*.

Table 6: Self Address DIP-switch Settings

Self Address	DIPs		
	3	**2**	**1**
1 Master	ON	ON	ON
2	ON	ON	OFF
3	ON	OFF	ON
4	ON	OFF	OFF
5	OFF	ON	ON
6	OFF	ON	OFF
7	OFF	OFF	ON
8	OFF	OFF	OFF

Up to 8 Matrix Switchers may be cascaded for control via a single port by configuring one Matrix Switcher as a Master (Self Address = 1)[1], while all the others are assigned as Slave Matrix Switchers or an ID other than "1".

1 In the case of interconnection between more than two RS-485 receivers-transmitters (including PC), the termination resistor must be disconnected on all the devices, except for the first (usually the PC) and last units on the communication line

6.1.2 Setting Connection DIP-Switches

When connecting a PC via the RS-232, set DIP-switch # 8 to ON. When connecting a PC via the RS-485, set DIP-switch # 8 to OFF.

DIP-switch # 5 enables or disables Reply from the matrix switcher to the PC. In some applications, it may be desirable for some machines not to reply to instructions received on the RS-232 and RS-485 ports. If so, set the Reply DIP-switch to OFF.

6.2 Controlling via RS-232 (for example, using a PC)

You can connect a PC (or other controller) to the **VS-808xl** via the RS-232 port.

To connect using the null-modem adapter provided with the machine (recommended method):

- Connect the RS-232 9-pin D-type rear panel port on the **VS-808xl** to the null-modem adapter and connect the null-modem adapter with a 9-wire flat cable to the RS-232 9-pin D-type port on your PC

To connect without using a null-modem adapter:

- Connect the RS-232 9-pin D-type port on your PC to the RS-232 9-pin D-type rear panel port on the **VS-808xl**, as *Figure 8* illustrates

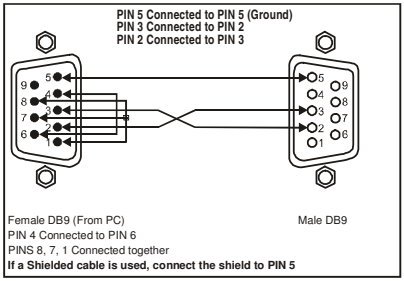

PIN 5 Connected to PIN 5 (Ground)
PIN 3 Connected to PIN 2
PIN 2 Connected to PIN 3
Female DB9 (From PC)
Male DB9
PIN 4 Connected to PIN 6
PINS 8, 7, 1 Connected together
If a Shielded cable is used, connect the shield to PIN 5

Figure 8: Connecting a PC Without Using a Null-Modem Adapter

1 The default is for Master (Self Address=1) and this is the recommended setting for a single machine

6.3 Controlling via RS-232 and RS-485

You can control up to eight single **VS-808xl** units with control from a PC via RS-232 (see section 6.2) and RS-485 as illustrated in *Figure 9*.

To control via RS-232 and RS-485, do as follows:

1. Connect the video sources and acceptors, the appropriate audio sources and acceptors, and the power cord to each **VS-808xl** unit.
2. On each **VS-808xl** unit, set the Self Address DIP-switches, as required[1] (see *Table 6*).
3. Connect the RS-232 port on the first unit to the computer[2].
4. Interconnect the RS-485 ports on all the **VS-808xl** units: from the RS-485 port on the first **VS-808xl** unit, to the RS-485 port on the second **VS-808xl** unit, and so on – up to the RS-485 port on the last unit.
5. Terminate the RS-485 line as described in section 6.1.2.

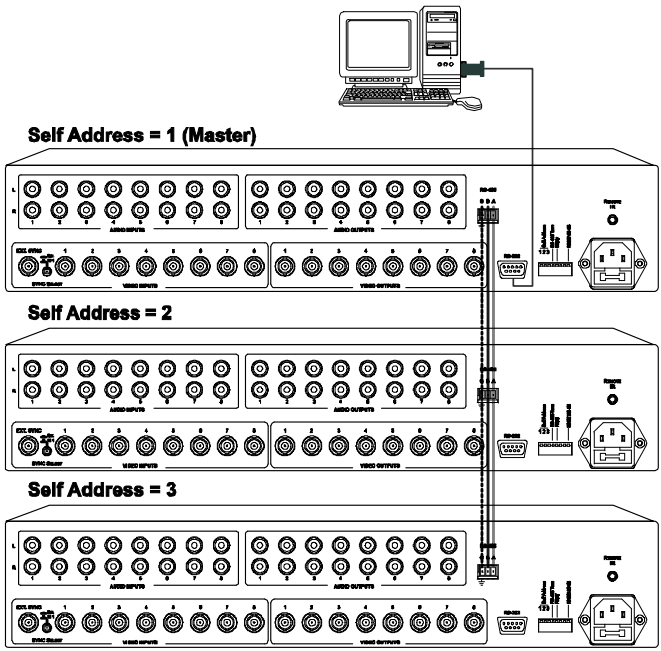


Figure 9: RS-232 and RS-485 Operation

1 The first unit (the master) will be set to Self Address = 1

2 As in section 6.2

6.4 RGB/YUV Switching with RS-232

Figure 10 describes a typical component video/RGB setup where every video signal is composed of three sub signals (components), which should be switched together (also valid for YUV components).

For RS-232 control of the component matrix switcher, an additional piece of equipment would be required. Since RS-232 can only be used for control between 2 pieces of equipment (for example, a PC and a switcher), a method of "distributing" the RS-232 to all three machines is needed. The Kramer **VP-14** *RS-232 Port Extender* is designed for this purpose.

Perform the following steps (as necessary):

1. Connect the RGB sources to the VIDEO INPUT connectors of the Matrix Switchers, connecting the "R" components to the first Matrix Switcher, "G" to the second, and "B" to the third. Make sure that each component of a video source is connected to the same input number on all three switchers.
2. Similarly, connect the RGB acceptors to the VIDEO OUTPUT connectors of the three Matrix Switchers.
3. If the video sources are synchronized, and vertical interval switching is desired, connect sync sources to all three machines, and select to work with EXT. SYNC (selector switch pressed in).
4. Assign all three machines as Self Address # 1 (see *Table 6*).
5. Set DIP-switch # 5 (Reply) of the first machine to ON. Set to OFF for the other machines.
6. Set DIP-switch # 8 of all the machines to ON (RS-232 communication between switchers and external controller).
7. Connect the serial port of the PC to a port on the **VP-14**, and connect each switcher to a **VP-14** port. Configure the DIP-switches of the **VP-14** for the 4 ports, which were connected.
8. Operate the Matrix Switchers, the computer, **VP-14**, the RGB sources and RGB acceptors.
9. The inputs can now be switched to the outputs. This is done via the front panel switches of the first switcher, and/or via the computer.

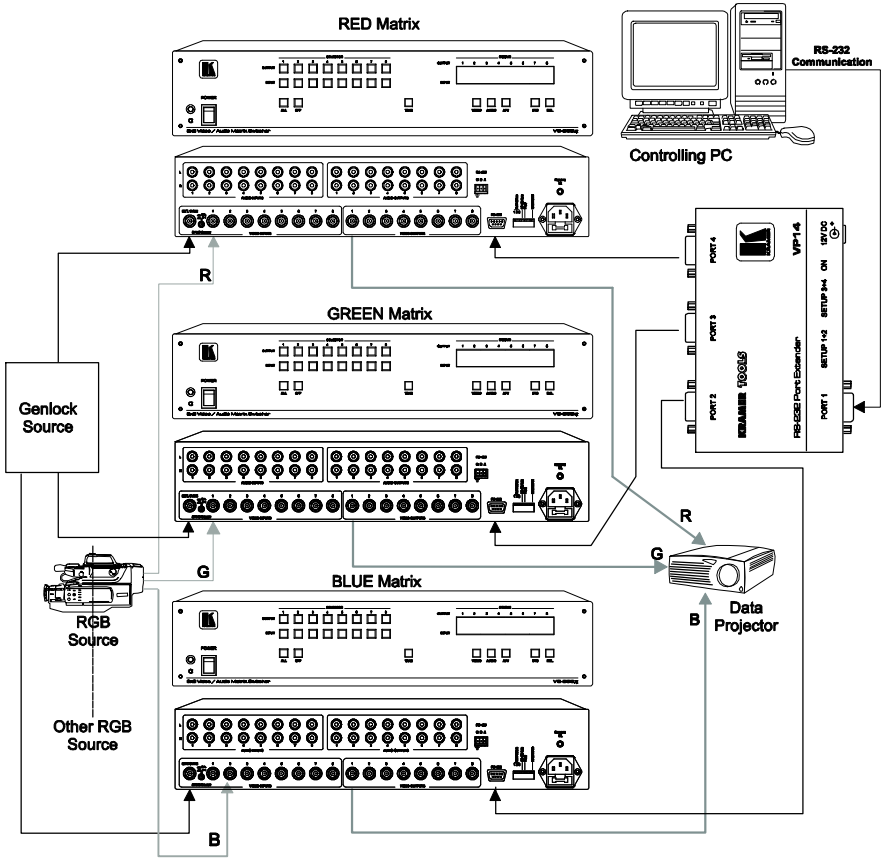


Figure 10: RGB Switching with RS-232 control via a Computer

7 Operating VS-808xl Matrix Switcher

Operate your **VS-808xl** via:

- The front panel buttons
- RS-232/ RS-485 serial commands transmitted by a touch screen system, PC or other serial controller

7.1 Displaying Unit Characteristics

The **VS-808xl** 7-segment Display shows the selected audio[1] or video[2] input switched to the marked output.

The unit characteristics[3] are displayed in the following circumstances:

- Immediately (and automatically) after switching on the power; and
- When simultaneously pressing and holding for 3 seconds the "IN" buttons 1, 2 and 3

7.2 Selecting and Connecting an Output and/or Input

To select an output or input simply press the designated button on the front panel. These buttons correspond to output connections as marked on the rear panel.

- To connect a video/audio input to a specific output, press the desired output button, followed by the desired input button
- To disconnect a video/audio input from a specific output, press the desired output button followed by the OFF button. To disconnect all the outputs, press the ALL button, followed by the OFF button
- To connect a video/audio input to all outputs, press the ALL button followed by the INPUT button corresponding to the input which is to be routed to all the outputs

1 When the Audio button illuminates, that is, when the audio breakaway mode is selected

2 When the Video button illuminates, that is, when the video breakaway mode is selected

3 Machine model and software version

7.3 Choosing the Audio-Follow-Video or Breakaway Option

You can switch stereo audio signals in one of two ways, either:

- Audio-follow-video (AFV), in which all operations relate to both the video and the audio channels; or
- Breakaway, in which video and audio channels switch independently

7.3.1 Setting the Audio-Follow-Video Option

To set the Audio-follow-video (AFV) option, press the AFV button. If the:

- AUDIO and VIDEO configurations are the same, then the AFV button illuminates. The audio will follow the video
- AUDIO differs from the VIDEO, then the AFV button will blink. Also, the audio outputs, that need to be changed, will blink[1] in the INPUT STATUS 7-segment display. Press the AFV button again[2]. The audio will follow the video, and the AFV illuminates.

7.3.2 Setting the Breakaway Option

To set the Breakaway option, press either the AUDIO (for audio control only) or the VIDEO (for video control only) button. If the:

- AUDIO button illuminates, switching operations relate to audio
- VIDEO button illuminates, switching operations relate to video

7.4 Storing/Recalling Input/Output Configurations

You can store and recall up to 8 input/output setups in non-volatile memory, using the INPUT SELECTOR buttons[3] 1 to 8 (6). The 8 (6) input/output configurations also include the relevant audio-follow-video/breakaway option definition, the video configurations and the audio configurations.

7.4.1 Storing an Input/Output Configuration

To store the current status in memory, do the following:

1. Press the STO button.
   The STO button blinks.
2. Press one of the INPUT SELECTOR[3] buttons from 1 to 8 (6). This will be the setup # in which the current status is stored.
   The memory stores the data at that reference.

1 Warning that you are about to modify the audio configuration for AFV operation

2 Failure to press the AFV button within one minute (the Timeout) will abort the action

3 For VP-606xl and VP-646, you can store up to 8 input/output configurations via RS-232

7.4.2 Recalling an Input/Output Configuration

To recall an input/output configuration, do the following:

1. Press the RCL button.
   The RCL button blinks.
2. Press the appropriate INPUT SELECTOR button (the INPUT SELECTOR button # corresponding to the setup #). The memory recalls the stored data from that reference.

7.4.3 Deleting an Input/Output Configuration

To delete an input/output configuration, do the following:

1. Press the STO and RCL buttons simultaneously.
   Both the STO and RCL buttons blink.
2. Press the appropriate INPUT SELECTOR button.
   This erases that specific input/output configuration from the memory, leaving it empty and available[1].

7.5 Resetting the Machine

To reset the machine, press INPUT buttons 1, 2 and 3 simultaneously. The machine resets itself and a 7-segment self-test is performed automatically.

1 Storing a new configuration over a previous configuration (without deleting it first) replaces the previous configuration

8 Technical Specifications

Table 7 details the **VS-606xl**, the **VS-808xl** and the **VS-804xl** technical specifications[1].

Table 7: Technical Specifications of the VS-606xl/VS-808xl/VS-804xl

INPUTS:	**VS-606xl**	6 composite video 1Vpp/75Ω on BNC connectors 1 sync/video genlock 1Vpp/75Ω with sync select switch 6 audio stereo, +4dBm/33kΩ on RCA connectors	
	VS-808xl	8 composite video 1Vpp/75Ω on BNC connectors 1 Sync/Video Genlock 1Vpp/75Ω with sync select switch 8 audio stereo, +4dBm/33kΩ on RCA connectors	
	VS-804xl	8 composite video 1Vpp/75Ω on BNC connectors 1 Sync/Video Genlock 1Vpp/75Ω with sync select switch 8 audio stereo, +4dBm/33kΩ on RCA connectors	
OUTPUTS:	**VS-606xl**	6 composite video, 1Vpp/75Ω on BNC connectors 6 audio stereo, +4dBm/50Ω (24Vpp max.) on RCA connectors	
	VS-808xl	8 composite video, 1Vpp/75Ω on BNC connectors 8 audio stereo, +4dBm/50Ω (24Vpp max.) on RCA connectors	
	VS-804xl	4 composite video, 1Vpp/75Ω on BNC connectors 4 audio stereo, 4dBm/50Ω (24Vpp max.) on RCA connectors	
MAX. OUTPUT LEVEL:		Video: 2Vpp	Audio: ±20Vpp
BANDWIDTH (-3dB):		Video: 200MHz	Audio: 100kHz
NON LINEARITY:		0.1%	
DIFF. GAIN:		0.05%	
DIFF. PHASE:		0.03Deg	
K-FACTOR:		< 0.05%	
SWITCHING:		Vertical interval	
S/N RATIO:		Video: 74dB	Audio: 88dB unweighted (1Vpp)
CROSSTALK (all hostile):		Video: -50dB @5MHz	Audio: –71.4dB @1kHz
CONTROLS:		Manual, RS-232 or RS-485	
COUPLING:		Video: DC	Audio: AC
AUDIO THD + NOISE:		0.016% (1V, 1kHz)	
AUDIO 2nd HARMONIC:		0.012%	
POWER SOURCE:		230V AC, 50/60 Hz (115V AC, USA) 11VA	
DIMENSIONS:		19” x 7” x 1U W, D, H rack mountable	
WEIGHT:		3.4 kg (7.5 lbs) approx.	
ACCESSORIES:		Power cord, null modem adapter, Windows®-based control software, rack ears, IR remote control	
OPTIONS:		External remote IR receiver cable	

1 Specifications are subject to change without notice

Table 8 details the **VS-646** and the **VS-848** technical specifications[1].

Table 8: Technical Specifications of the VS-646/VS848

INPUTS: **VS-646**	6 composite video, 1Vpp/75Ω on BNC connectors 1 sync/video genlock 1Vpp/75Ω with sync select switch 6 balanced audio stereo, +4dBm/33kΩ on detachable terminal blocks	
VS-848	8 composite video, 1Vpp/75Ω on BNC connectors. 1 sync/video Genlock 1Vpp/75Ω with sync select switch 8 balanced audio stereo, +4dBm/33kΩ on detachable terminal blocks	
OUTPUTS: **VS-646**	6 composite video, 1Vpp/75Ω on BNC connectors 6 balanced audio stereo, +4dBm/50Ω (24Vpp max.) on detachable terminal blocks	
VS-848	8 composite video, 1Vpp/75Ω on BNC connectors 8 balanced audio stereo, +4dBm/50Ω (24Vpp max.) on detachable terminal blocks	
MAX. OUTPUT LEVEL:	Video: 2Vpp	Audio: 24Vpp (>20dBm)
BANDWIDTH (-3dB):	Video: 200MHz	Audio: 100kHz
NON LINEARITY:	0.1%	
DIFF. GAIN:	0.05%	
DIFF. PHASE:	0.03Deg	
K-FACTOR:	<0.05%	
S/N RATIO:	Video: 74dB	Audio: 84dB unweighted (1Vpp)
CROSSTALK (all hostile):	Video: -50dB @5MHz	Audio: –71.4dB @1kHz
CONTROLS:	Manual, RS-232 or RS-485	
COUPLING:	Video: DC	Audio: AC
AUDIO THD + NOISE:	0.025% (1V, 1kHz)	
AUDIO 2nd HARMONIC:	0.013%	
POWER SOURCE:	230V AC, 50/60Hz (115V AC, USA) 9 VA	
DIMENSIONS:	19” x 7” x 1U W, D, H rack mountable	
WEIGHT:	3.5 kg (7.5 lbs) approx.	
ACCESSORIES:	Power cord, null modem adapter, Windows®-based control software, rack ears	
OPTIONS:	External remote IR receiver cable	

1 Specifications are subject to change without notice

9 Communication Protocol

The **VS-808xl** is compatible with Kramer's Protocol 2000 (version 0.50) (below). This RS-232/RS-485 communication protocol uses four bytes of information as defined below. For RS-232, a null-modem connection between the machine and controller is used. The default data rate is 9600 baud, with no parity, 8 data bits and 1 stop bit.

Table 9: Protocol Definitions

MSB							LSB
	DESTI-NATION	**INSTRUCTION**					
0	D	N5	N4	N3	N2	N1	N0
7	6	5	4	3	2	1	0
1st byte							
	INPUT						
1	I6	I5	I4	I3	I2	I1	I0
7	6	5	4	3	2	1	0
2nd byte							
	OUTPUT						
1	O6	O5	O4	O3	O2	O1	O0
7	6	5	4	3	2	1	0
3rd byte							
			MACHINE NUMBER				
1	OVR	X	M4	M3	M2	M1	M0
7	6	5	4	3	2	1	0
4th byte							

1st BYTE: Bit 7 – Defined as 0.
D – "DESTINATION": 0 - for sending information to the switchers (from the PC);
1 - for sending to the PC (from the switcher).
N5…N0 – "INSTRUCTION"
The function that is to be performed by the switcher(s) is defined by the INSTRUCTION (6 bits). Similarly, if a function is performed via the machine's keyboard, then these bits are set with the INSTRUCTION NO., which was performed. The instruction codes are defined according to the table below (INSTRUCTION NO. is the value to be set for N5…N0).

2nd BYTE: Bit 7 – Defined as 1.
I6…I0 – "INPUT".
When switching (i.e. instruction codes 1 and 2), the INPUT (7 bits) is set as the input number which is to be switched. Similarly, if switching is done via the machine's front-panel, then these bits are set with the INPUT NUMBER which was switched. For other operations, these bits are defined according to the table.

3rd BYTE: Bit 7 – Defined as 1.
O6…O0 – "OUTPUT".
When switching (i.e. instruction codes 1 and 2), the OUTPUT (7 bits) is set as the output number which is to be switched. Similarly, if switching is done via the machine's front-panel, then these bits are set with the OUTPUT NUMBER which was switched. For other operations, these bits are defined according to the table.

4th BYTE: Bit 7 – Defined as 1.
Bit 5 – Don't care.
OVR – Machine number override.
M4…M0 – MACHINE NUMBER.
Used to address machines in a system via their machine numbers. When several machines are controlled from a single serial port, they are usually configured together with each machine having an individual machine number. If the OVR bit is set, then all machine numbers will accept (implement) the command, and the addressed machine will reply.
For a single machine controlled via the serial port, always set M4…M0 = 1, and make sure that the machine itself is configured as MACHINE NUMBER = 1.

Table 10: Instruction Codes for Protocol 2000

Note: All values in the table are decimal, unless otherwise stated.

INSTRUCTION		DEFINITION FOR SPECIFIC INSTRUCTION		NOTE
#	DESCRIPTION	INPUT	OUTPUT	
0	RESET VIDEO	0	0	1
1	SWITCH VIDEO	Set equal to video input which is to be switched (0 = disconnect)	Set equal to video output which is to be switched (0 = to all the outputs)	2, 15
2	SWITCH AUDIO	Set equal to audio input which is to be switched (0 = disconnect)	Set equal to audio output which is to be switched (0 = to all the outputs)	2
3	STORE VIDEO STATUS	Set as SETUP #	0 - to store 1 - to delete	2, 3, 15
4	RECALL VIDEO STATUS	Set as SETUP #	0	2, 3, 15
5	REQUEST STATUS OF A VIDEO OUTPUT	Set as SETUP #	Equal to output number whose status is reqd	4, 3
6	REQUEST STATUS OF AN AUDIO OUTPUT	Set as SETUP #	Equal to output number whose status is reqd	4, 3
7	VIS SOURCE	Set as input # when OUTPUT byte = 6; OR set as output # when OUTPUT byte = 7; OR set as blank period (in steps of 25ms) when OUTPUT byte = 32; OR set = 0. *****	0 - No VIS (immediate) 1 - Input # 1 2 - External digital sync 3 - External analog sync 4 - Dynamic sync 5 - Inter-machine sync 6 - Input # (INPUT byte) 7 - Output #(INPUT byte) 8 - User-defined sync 32 - RGBHV seamless switching 64 - Set for delayed switch 65 - Execute delayed switch 66 - Cancel delayed switch setting	2, 5, 17, 18
8	BREAKAWAY SETTING	0	0 - audio-follow-video 1 - audio breakaway	2
		1	0 - FOLLOW mode 1 - Normal mode	15
9	VIDEO/AUDIO TYPE SETTING	0 - for video	0 - CV 1 - YC 2 - YUV 3 - RGBS 4 - SDI 5 - CV+YC 6 - VGA scaler 7 - DVI	2
		1 - for audio	O0=0 – Unbalanced audio O0=1 – Balanced audio O1=0 – Digital audio O1=1 – Analog audio O4=0, O3=0, O2=0-Mono O4=0, O3=0,O2=1-Stereo	
		2 - for VGA and DVI	1 - 640X480 2 - 800X600 3 - 1024X768	
10	REQUEST VIS SETTING	Set as SETUP #, or set to 126 or 127 to request if machine has this function	0 - VIS source 1 - Input # or output # of source 2 - Vertical sync freq (Hz)	3, 4, 6, 7
11	REQUEST BREAKAWAY SETTING	Set as SETUP #, or set to 126 or 127 to request if machine has this function	0 - Request audio breakaway setting 1 - Request “FOLLOW” setting	3, 4, 6, 15
12	REQUEST VIDEO/AUDIO TYPE SETTING	Set as SETUP #, or set to 126 or 127 to request if machine has this function	0 - for video 1 - for audio 2 - for VGA	3, 4, 6
13	SET HIGHEST MACHINE ADDRESS	0 - for video 1 - for audio	Set equal to highest machine address	2
14	REQUEST HIGHEST MACHINE ADDRESS	0 - for video 1 - for audio	0	4
15	REQUEST WHETHER SETUP IS DEFINED/VALID INPUT IS DETECTED	SETUP # or Input #	0 - for checking if setup is defined 1 - for checking if input is valid	8

INSTRUCTION		DEFINITION FOR SPECIFIC INSTRUCTION		NOTE
#	DESCRIPTION	INPUT	OUTPUT	
16	ERROR/BUSY	For invalid/valid input (i.e. OUTPUT byte = 4 or OUTPUT byte = 5), this byte is set as the input #	0 - error 1 - invalid instruction 2 - out of range 3 - machine busy 4 - invalid input 5 - valid input	9, 25
17	RESERVED	-	-	10
18	RESET AUDIO	0	0	1
19	STORE AUDIO STATUS	Set as SETUP #	0 - to store 1 - to delete	2, 3
20	RECALL AUDIO STATUS	Set as SETUP #	0	2, 3
21	SET VIDEO PARAMETER	Equal to input/output number whose video parameter is to be set (0 = all)	Set as parameter value	2, 11, 24
22	SET AUDIO PARAMETER	Equal to input/output number whose parameter is to be set (0 = all)	Set as parameter value	2, 11, 24
23	INCREASE/DECREASE VIDEO PARAMETER	Equal to input/output number whose video parameter is to be increased/decreased (0 = all)	0 - increase video gain 1 - decrease video gain 2 - increase contrast 3 - decrease contrast 4 - increase brightness 5 - decrease brightness 6 - increase color 7 - decrease color 8 - increase hue 9 - decrease hue 16 - increase H-phase 17 - decrease H-phase 18 - increase V-position 19 - decrease V-position	24
24	INCREASE/DECREASE AUDIO PARAMETER	Equal to input/output number whose parameter is to be increased/decreased (0 = all)	0 - increase output 1 - decrease output 2 - increase left output 3 - decrease left output 4 - increase right output 5 - decrease right output 6 - increase input 7 - decrease input 8 - increase left input 9 - decrease left input 10 -increase right input 11 - decrease right input	24
25	REQUEST AUDIO PARAMETER	Equal to input/output number whose parameter is requested	0	6, 24
26	REQUEST VIDEO PARAMETER	Equal to input/output number whose video parameter is requested	0	6, 24
30	LOCK FRONT PANEL	0 - Panel unlocked 1 - Panel locked	0	2
31	REQUEST WHETHER PANEL IS LOCKED	0	0	16
32 to 35	RESERVED	-	-	10
40	DIRECT MEMORY SAVE	Memory address	Data	20
42	AUDIO PARAMETER SETTINGS FOR INSTRUCTIONS 22, 24, 25	INPUT Bit: I0=input; 1=output I1 - Left I2 - Right	0 - Gain 1 - Bass 2 - Treble 3 - Midrange 4 - Mix On	24

INSTRUCTION		DEFINITION FOR SPECIFIC INSTRUCTION		NOTE
#	DESCRIPTION	INPUT	OUTPUT	
43	VIDEO PARAMETER SETTINGS FOR INSTRUCTIONS 21, 23, 26	1 – Input 2 – Output	0 - video gain 1 - contrast 2 - brightness 3 - color 4 - hue 5 - H-phase 6 - V-position	24
44	MEDIA CONTROL	Set equal to switch number	Switch data	
45	REQUEST MEDIA CONTROL SETTINGS	Set equal to switch number	0	
56	CHANGE TO ASCII	0	1 - SVS protocol 2 - Generic protocol	19
57	SET AUTO-SAVE	I3 - no save I4 - auto-save	0	12, 2
58	EXECUTE LOADED DATA	Set as 0, or as SETUP #.	1-Take 2-Cancel	22, 3
59	LOAD VIDEO DATA	Set equal to video input (0 = disconnect) (127 = load SETUP #)	Set equal to video output (0 = to all the outputs) or SETUP #	22, 23
60	LOAD AUDIO DATA	Set equal to audio input (0 = disconnect) (127 = load SETUP #)	Set equal to audio output (0 = to all the outputs) or SETUP #	22, 23
61	IDENTIFY MACHINE	1 - video machine name 2 - audio machine name 3 - video software version 4 - audio software version 5 - RS422 controller name 6 - RS422 controller version 7 - remote control name 8 - remote software version 9 - Protocol 2000 revision	0 - Request first 4 digits 1 - Request first suffix 2 - Request second suffix 3 - Request third suffix 10 - Request first prefix 11 - Request second prefix 12 - Request third prefix	13
62	DEFINE MACHINE	1 - number of inputs 2 - number of outputs 3 - number of setups	1 - for video 2 - for audio 3 - for SDI 4 - for remote panel 5 - for RS-422 controller	14
63	EXTENDED DATA	7 MSBs for INPUT data	7 MSBs for OUTPUT data	20

NOTES on the above table:

NOTE 1 - When the master switcher is reset, (e.g. when it is turned on), the reset code is sent to the PC. If this code is sent to the switchers, it will reset according to the present power-down settings.

NOTE 2 - These are bi-directional definitions. That is, if the switcher receives the code, it will perform the instruction; and if the instruction is performed (due to a keystroke operation on the front panel), then these codes are sent. For example, if the HEX code
01 85 88 83
was sent from the PC, then the switcher (machine 3) will switch input 5 to output 8. If the user switched input 1 to output 7 via the front panel keypad, then the switcher will send HEX codes:
41 81 87 83
to the PC.
When the PC sends one of the commands in this group to the switcher, then, if the instruction is valid, the switcher replies by sending to the PC the same four bytes that it was sent (except for the first byte, where the DESTINATION bit is set high).

NOTE 3 - SETUP # 0 is the present setting. SETUP # 1 and higher are the settings saved in the switcher's memory, (i.e. those used for Store and Recall).

NOTE 4 - The reply to a "REQUEST" instruction is as follows: the same instruction and INPUT codes as were sent are returned, and the OUTPUT is assigned the value of the requested parameter. The replies to instructions 10 and 11 are as per the definitions in instructions 7 and 8 respectively. For example, if the present status of machine number 5 is breakaway setting, then the reply to the HEX code
0B 80 80 85

would be HEX codes
4B 80 81 85
NOTE 5 – For the OUTPUT byte set as 6, the VIS source is the input selected using the OUTPUT byte. Similarly, for the OUTPUT byte set as 7, the VIS source is the output selected using the OUTPUT byte. Note also, that on some machines the sync source is not software selectable, but is selected using switches, jumpers, etc!

NOTE 6 – If INPUT is set to 127 for these instructions, then, if the function is defined on this machine, it replies with OUTPUT=1. If the function is not defined, then the machine replies with OUTPUT=0, or with an error (invalid instruction code).

If the INPUT is set to 126 for these instructions, then, if possible, the machine will return the current setting of this function, even for the case that the function is not defined. For example, for a video switcher which always switches during the VIS of input #1, (and its VIS setting cannot be programmed otherwise), the reply to the HEX code
0A FE 80 81 (i.e. request VIS setting, with INPUT set as 126dec)
would be HEX codes
4A FE 81 81 (i.e. VIS setting = 1, which is defined as VIS from input #1).

NOTE 7 – Setting OUTPUT to 0 will return the VIS source setting as defined in instruction #7. Setting to 1 will return the input # or output # of the sync source (for the case where the VIS source is set as 6 or as 7 in instruction #7). Setting to 2 returns the vertical sync frequency (0 for no input sync, 50 for PAL, 60 for NTSC, 127 for error).

NOTE 8 - The reply is as in TYPE 3 above, except that here the OUTPUT is assigned with the value 0 if the setup is not defined/no valid input is detected; or 1 if it is defined/valid input is detected.

NOTE 9 - An error code is returned to the PC if an invalid instruction code was sent to the switcher, or if a parameter associated with the instruction is out of range (e.g. trying to save to a setup greater than the highest one, or trying to switch an input or output greater than the highest one defined). This code is also returned to the PC if an RS-232 instruction is sent while the machine is being programmed via the front panel. Reception of this code by the switcher is not valid.

NOTE 10 – This code is reserved for internal use.

NOTE 11 – For machines where the video and/or audio parameter is programmable.

NOTE 12 - Under normal conditions, the machine's present status is saved each time a change is made. The "power-down" save (auto-save) may be disabled using this code. Note that whenever the machine is turned on, the auto-save function is set.

NOTE 13 - This is a request to identify the switcher/s in the system. If the OUTPUT is set as 0, and the INPUT is set as 1, 2, 5 or 7, the machine will send its name. The reply is the decimal value of the INPUT and OUTPUT. For example, for a 2216, the reply to the request to send the audio machine name would be (HEX codes):
7D 96 90 81 (i.e. 128dec+ 22dec for 2nd byte, and 128dec+ 16dec for 3rd byte).

If the request for identification is sent with the INPUT set as 3 or 4, the appropriate machine will send its software version number. Again, the reply would be the decimal value of the INPUT and OUTPUT - the INPUT representing the number in front of the decimal point, and the OUTPUT representing the number after it. For example, for version 3.5, the reply to the request to send the version number would be (HEX codes):
7D 83 85 81 (i.e. 128dec+ 3dec for 2nd byte, 128dec+ 5dec for 3rd byte).

If the OUTPUT is set as 1, then the ASCII coding of the lettering following the machine's name is sent. For example, for the VS-7588YC, the reply to the request to send the first suffix would be (HEX codes):
7D D9 C3 81 (i.e. 128dec+ ASCII for "Y"; 128dec+ ASCII for "C").

NOTE 14 - The number of inputs and outputs refers to the specific machine which is being addressed, not to the system. For example, if six 16X16 matrices are configured to make a 48X32 system (48 inputs, 32 outputs), the reply to the HEX code
3E 82 81 82 (i.e. request the number of outputs)
would be HEX codes
7E 82 90 82
i.e. 16 outputs

NOTE 15 – When the OVR bit (4th byte) is set, then the "video" commands have universal meaning. For example, instruction 1 (SWITCH VIDEO) will cause all units (including audio, data, etc.) to switch. Similarly, if a machine is in "FOLLOW" mode, it will perform any "video" instruction.

NOTE 16 - The reply to the "REQUEST WHETHER PANEL IS LOCKED" is as in NOTE 4 above, except that here the OUTPUT is assigned with the value 0 if the panel is unlocked, or 1 if it is locked.

NOTE 17 – For clean switching of RGBHV video, the "seamless switching" option may be used. The blanking period for the transition of the RGB sources may be set in this case, in steps of 25 milliseconds.

For example, to set for 350ms blanking time (14 steps), send HEX codes
07 8E A0 81

NOTE 18 – Delayed execution allows switching after a delay dictated by RS-232. To do this, the user sends instruction 7 with the "Set for delayed switch" option (64dec) before sending the switch command (instruction 1) or pressing via front panel. The switch is not executed (unless timed-out) until the "Execute delayed switch" code is sent, or the "Set for delayed switch" code is sent again. (The mode is automatically cancelled after implementation of the switch if the "execute" command is used).
For example, to connect input 4 to output 3 after a delay, send HEX codes
07 80 C0 81 (set for delayed switch)
01 84 83 81 (switch code)
then, after the required delay, send HEX codes
07 80 C1 81 (execute delayed switch)
to implement the switch.

NOTE 19 – After this instruction is sent, the unit will respond to the ASCII command set defined by the OUTPUT byte. The ASCII command to operate with the HEX command set must be sent in order to return to working with HEX codes.

NOTE 20 – When data (i.e. the INPUT and/or OUTPUT bytes) of more than 7 bits is required, this instruction is sent before sending the instruction needing the additional bits. The data in this instruction then becomes the Most Significant Bits of that next instruction. For example, to set the audio gain (instruction 22) of output 3 to 681dec (2A9hex), you would first send HEX codes
3F 80 85 81
and then send HEX codes
16 83 A9 81.
To set the audio gain of output 6 to 10013dec (271Dhex), first send HEX codes
3F 80 CE 81
followed by HEX codes
16 86 9D 81.

NOTE 21 – To store data in the non-volatile memory of the unit, e.g. the EEPROM for saving SETUPS. The EEPROM address is sent using the INPUT byte, and the data to be stored is sent using the OUTPUT byte. To use this instruction, it is necessary to understand the memory map, and memory structure of the particular machine.

NOTE 22 – Instruction 59 and instruction 60 load data for sending to the crosspoint switcher (or for storing in a SETUP), i.e. the data is "lined-up" to be executed later. Instruction 58 executes the loaded data.

NOTE 23 – If the INPUT byte is set as 127dec, then the data stored in a SETUP is loaded. The SETUP # is in the OUTPUT byte.

NOTE 24 – Further information needed in instructions 21, 22, 25 and 26, is sent using instruction 42 – which is sent prior to the instruction. For example, to request the audio gain value of right input # 9, send hex codes
2A 84 80 81
and then send HEX codes
19 89 81 81.
To set MIX mode, send hex codes
2A 81 84 81
and then send HEX codes
16

NOTE 25 – For units which detect the validity of the video inputs, Instruction 16 will be sent whenever the unit detects a change in the state of an input (in real-time).
For example, if input 3 is detected as invalid, the unit will send the HEX codes
10 83 84 81
If input 7 is detected as valid, then the unit will send HEX codes
10 87 85 81.

10 Table of Hex Codes for the Master VS-808xl

Table 11 shows the "HEX" codes for switching the Master **VS-808xl**.

NOTE: The table is also valid[1] for the **VS-606xl** and **VS-646** if the last two rows and columns are ignored

Table 11: Hex Codes for Switching the Master VS-808xl

	OUT1	OUT 2	OUT 3	OUT 4	OUT 5	OUT 6	OUT 7	OUT 8
IN 1	01 81 81 81	01 81 82 81	01 81 83 81	01 81 84 81	01 81 85 81	01 81 86 81	01 81 87 81	01 81 88 81
IN 2	01 82 81 81	01 82 82 81	01 82 83 81	01 82 84 81	01 82 85 81	01 82 86 81	01 82 87 81	01 82 88 81
IN 3	01 83 81 81	01 83 82 81	01 83 83 81	01 83 84 81	01 83 85 81	01 83 86 81	01 83 87 81	01 83 88 81
IN 4	01 84 81 81	01 84 82 81	01 84 83 81	01 84 84 81	01 84 85 81	01 84 86 81	01 84 87 81	01 84 88 81
IN 5	01 85 81 81	01 85 82 81	01 85 83 81	01 85 84 81	01 85 85 81	01 85 86 81	01 85 87 81	01 85 88 81
IN 6	01 86 81 81	01 86 82 81	01 86 83 81	01 86 84 81	01 86 85 81	01 86 86 81	01 86 87 81	01 86 88 81
IN 7	01 87 81 81	01 87 82 81	01 87 83 81	01 87 84 81	01 87 85 81	01 87 86 81	01 87 87 81	01 87 88 81
IN 8	01 88 81 81	01 88 82 81	01 88 83 81	01 88 84 81	01 88 85 81	01 88 86 81	01 88 87 81	01 88 88 81

1 This table is also valid for the VS-804xl if the last four columns are ignored

LIMITED WARRANTY

Kramer Electronics (hereafter *Kramer*) warrants this product free from defects in material and workmanship under the following terms.

HOW LONG IS THE WARRANTY

Labor and parts are warranted for seven years from the date of the first customer purchase.

WHO IS PROTECTED?

Only the first purchase customer may enforce this warranty.

WHAT IS COVERED AND WHAT IS NOT COVERED

Except as below, this warranty covers all defects in material or workmanship in this product. The following are not covered by the warranty:

1. Any product which is not distributed by Kramer, or which is not purchased from an authorized Kramer dealer. If you are uncertain as to whether a dealer is authorized, please contact Kramer at one of the agents listed in the Web site www.kramerelectronics.com.
2. Any product, on which the serial number has been defaced, modified or removed, or on which the WARRANTY VOID IF TAMPERED sticker has been torn, reattached, removed or otherwise interfered with.
3. Damage, deterioration or malfunction resulting from:
   i) Accident, misuse, abuse, neglect, fire, water, lightning or other acts of nature
   ii) Product modification, or failure to follow instructions supplied with the product
   iii) Repair or attempted repair by anyone not authorized by Kramer
   iv) Any shipment of the product (claims must be presented to the carrier)
   v) Removal or installation of the product
   vi) Any other cause, which does not relate to a product defect
   vii) Cartons, equipment enclosures, cables or accessories used in conjunction with the product

WHAT WE WILL PAY FOR AND WHAT WE WILL NOT PAY FOR

We will pay labor and material expenses for covered items. We will not pay for the following:

1. Removal or installations charges.
2. Costs of initial technical adjustments (set-up), including adjustment of user controls or programming. These costs are the responsibility of the Kramer dealer from whom the product was purchased.
3. Shipping charges.

HOW YOU CAN GET WARRANTY SERVICE

1. To obtain service on you product, you must take or ship it prepaid to any authorized Kramer service center.
2. Whenever warranty service is required, the original dated invoice (or a copy) must be presented as proof of warranty coverage, and should be included in any shipment of the product. Please also include in any mailing a contact name, company, address, and a description of the problem(s).
3. For the name of the nearest Kramer authorized service center, consult your authorized dealer.

LIMITATION OF IMPLIED WARRANTIES

All implied warranties, including warranties of merchantability and fitness for a particular purpose, are limited in duration to the length of this warranty.

EXCLUSION OF DAMAGES

The liability of Kramer for any effective products is limited to the repair or replacement of the product at our option. Kramer shall not be liable for:

1. Damage to other property caused by defects in this product, damages based upon inconvenience, loss of use of the product, loss of time, commercial loss; or:
2. Any other damages, whether incidental, consequential or otherwise. Some countries may not allow limitations on how long an implied warranty lasts and/or do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations and exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights, which vary from place to place.

NOTE: All products returned to Kramer for service must have prior approval. This may be obtained from your dealer.

This equipment has been tested to determine compliance with the requirements of:

EN-50081:	"Electromagnetic compatibility (EMC); generic emission standard. Part 1: Residential, commercial and light industry"
EN-50082:	"Electromagnetic compatibility (EMC) generic immunity standard. Part 1: Residential, commercial and light industry environment".
CFR-47:	FCC* Rules and Regulations: Part 15: "Radio frequency devices Subpart B Unintentional radiators"

CAUTION!

- Servicing the machines can only be done by an authorized Kramer technician. Any user who makes changes or modifications to the unit without the expressed approval of the manufacturer will void user authority to operate the equipment.
- Use the supplied DC power supply to feed power to the machine.
- Please use recommended interconnection cables to connect the machine to other components.

  * FCC and CE approved using STP cable (for twisted pair products)

For the latest information on our products and a list of Kramer distributors, visit our Web site: www.kramerelectronics.com, where updates to this user manual may be found.
We welcome your questions, comments and feedback.

Safety Warning:
Disconnect the unit from the power supply before opening/servicing.

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